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GEOPHYSICS, ASTRONOMY AND SPACE
No. 426

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USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS
GEOPHYSICS, ASTRONOMY AND SPACE

No. 426

This serial publication contains abstracts of articles and news items from USSR and Eastern Europe scientific and technical journals on the specific subjects reflected in the table of contents.

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I. ASTRONOMY

Abstracts of Scientific Articles

GENERATION OF SOLAR RADIO BURSTS OF "SPIKE" TYPE

Moscow ASTRONOMICHESKIY ZHURNAL in Russian Vol 55, No 3, 1978 pp 572-585

[Article by G. P. Chernov, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, "Generation of Solar Radio Bursts of the 'Spike' Type by Electron Fluxes"]

[Abstract] Together with known spectral data, investigations of the time profiles of "spikes" also indicate that these spikes are generated by electron fluxes (excitation of plasma waves and subsequent transformation into electromagnetic radiation). In order to explain the brevity and narrow-band nature of the spikes it is assumed that the electron fluxes exciting the spikes are generated instantaneously near the emission region, have small dimensions ($\sim 0.5 \cdot 10^8$ cm) and a small velocity dispersion ($\Delta V/V \lesssim 0.1$). The predominantly reverse drift of the spikes present in the group ("rain" phenomenon) is explained by the group lag of radio emission from an extended source. The total duration of the burst is determined by the total time involved in plateau formation in the particle velocity distribution function. Allowance only for the attenuation of plasma waves by collisions gives temperatures of coronal plasma which are too low ($\sim 0.5 \cdot 10^6$ K). It is shown that this is associated with the important role played in the absorption of plasma waves by Landau attenuation on rapid particles of the flux; this becomes particularly effective in fluxes which are nonmonotonic with respect to velocities. The author proposes a model for computing the time profiles of spikes. A satisfactory agreement between theoretical and observed profiles makes it possible to determine the linear dimensions of the fluxes, the dispersion of velocities and the attenuation (decay) constant. The strong polarization of the spikes is attributable to the conditions for the emergence of radioemission from the source, where the magnetic field strength is about 3-4 oe.

[480]

PARTICLE ACCELERATION IN SOLAR FLARE CURRENT LAYER

Moscow ASTRONOMICHESKIY ZHURNAL in Russian Vol 55, No 3, 1978 pp 607-616

[Article by L. A. Pustil'nik, Special Astrophysical Observatory, "Particle Acceleration in Solar Flare Current Layer"]

[Abstract] The author has analyzed the applicability and effectiveness of the main mechanisms of particle acceleration under the real conditions of a turbulent current layer of a solar flare. It is shown that the realization both of a purely regular mechanism of acceleration by the electric field (neglecting "particle-plasmon" elastic collisions) and also purely stochastic acceleration in the field of turbulent pulsations (neglecting the regular electric field of the layer) involves difficulties in theoretical respects and in a comparison with observations. The author has proposed a mechanism of "quasidiffuse" acceleration based on simultaneous allowance for both the effects of a regular electric field and the effects of plasma turbulence. In this mechanism the energy of the particles is increased due to spatial diffusion of the accelerated particles in the outer electric field. The diffusion is caused by the high frequency of the "particle-plasmon" elastic collisions. It is shown that the mechanism leads to a greater effectiveness of acceleration in comparison with the classical mechanisms. Computations of the energy spectrum, carried out with allowance for the three-dimensionality of the magnetic field of the layer, gives a spectrum of accelerated particles $n^*(\varepsilon) \propto \varepsilon^{-\gamma}$, where $\gamma \approx 3$. The determined value of the high-energy cutoff in the energy spectrum and the chemical composition of the accelerated particles agree well with observations.

[480]

EXTERNAL GRAVITATIONAL FIELD OF SATURN AND RINGS

Moscow ASTRONOMICHESKIY ZHURNAL in Russian Vol 55, No 3, 1978 pp 628-634

[Article by V. P. Trubitsyn, A. M. Bobrov, P. P. Vasil'yev and Ya. A. Lev, Institute of Physics of the Earth, "External Gravitational Field of Saturn and Rings"]

[Abstract] The authors have computed the contributions to the outer gravitational field of Saturn from the rings and from the tides in the planet caused by the rings. The radial distribution of density in the rings was stipulated both by highly simple models (uniform ring) and on the basis of data on the optical thicknesses of the rings. The article gives computations of gravitational moments of the rings and the tidal corrections to the moments of Saturn to the tenth harmonic. The higher moments of the rings, with a mass of the rings equal to 10^{-6} the mass of Saturn, exceed the corresponding moments from the planet, beginning from the eighth harmonic. The developed method makes it possible to ascertain the mass of the rings and the proper moments of the planet necessary for formulating models of its internal structure.

[480]

II. METEOROLOGY

Abstracts of Scientific Articles

THEORY OF AUTOOSCILLATIONS OF CLIMATE AND GLACIATION

Leningrad IZVESTIYA VSESOYUZNOGO GEOGRAFICHESKOGO OBSHCHESTVA in Russian
Vol 10, No 3, 1978 pp 201-207

[Article by O. P. Chizhov, "Development of the Theory of Autooscillations of Climate and Glaciation"]

[Abstract] The article examines the principles of current concepts concerning the autooscillatory mechanism of major glacial-interglacial climatic variations and fluctuations of glaciation proposed about 50 years ago in the USSR, and about 25 years ago in the United States, and the present-day development of the theory of glacioclimatic autooscillations. In qualitative form the hypothesis was expressed for the first time by the Soviet Captain Ye. S. Gerent, and 25 years later, independently, by the American geologist W. Stokes. The use of the present-day theory of complex systems and automatic control enabled V. Ya. and S. Ya. Sergin (in 1966 and later) to formulate a functional model of dynamics of the system "earth's surface-atmosphere" or a more definite system "glaciers-ocean-atmosphere" and demonstrate in their mathematical model that the variations of climate and glaciation are similar to those transpiring in the Pleistocene with an alternation of glacial and interglacial epochs.

[470]

DROPLET-SPRAY MECHANISM OF OCEAN-ATMOSPHERE ENERGY EXCHANGE

Leningrad IZVESTIYA VSESOYUZNOGO GEOGRAFICHESKOGO OBSHCHESTVA in Russian
Vol 110, No 3, 1978 pp 257-261

[Article by D. M. Belov, "Method for Experimental Investigation of the Drop-Spray Mechanism of Energy Exchange Between the Ocean and the Atmosphere"]

[Abstract] The study of the processes of interaction between a water surface and the atmosphere, and especially their small-scale interaction, is one of the central problems in modern hydrometeorology. This article is devoted to a method for experimental determination of heat fluxes from the water surface into the atmosphere, this being one of the most important components of energy exchange between the water surface and the atmosphere. In this study the author proposes that three dynamic states of the "water-atmosphere" system be distinguished, the most important factor determining the dynamic state of the "water-atmosphere" system being the wind velocity over the water surface. Against this background, the article describes experimental investigations of droplet-spray formations. The study of droplet-spray formed clouds observed when there is strong surf was carried out at the hydrometeorological station at Cape Shmidt, on the Chukchi Sea, during autumn. At the time of heavy surf the following parameters were measured: length of spray cloud, its lifetime, liquid-water content. A study was made of the droplet-size distribution in the cloud at different distances from the zone of spray formation and at different heights. On the basis of the statistical analysis of the collected data a formula was derived for calculating the lifetime of the spray cloud. It was possible to ascertain the confidence intervals between which the lifetime of the spray cloud falls. It was found that with an increase in the height of the collapsing wave the mean lifetime of the spray clouds increases. The proposed method for experimental determination of the parameters of droplet spray clouds can be used for supplementing inadequate data on the energy exchange between the ocean and the atmosphere under stormy conditions.

[470]

III. OCEANOGRAPHY

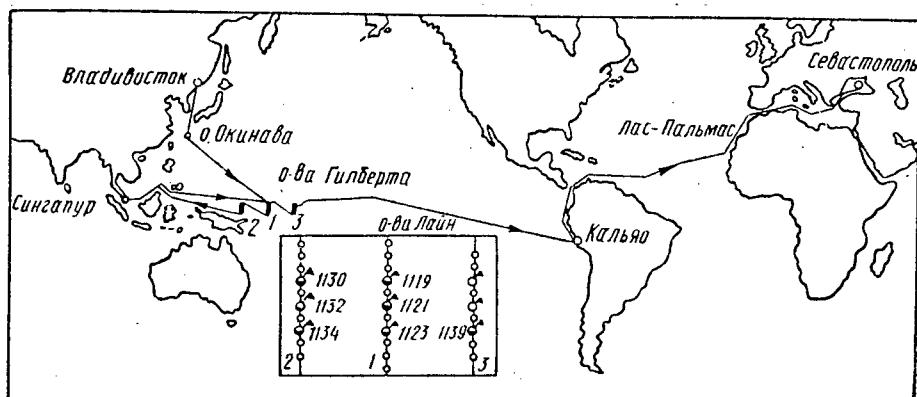
Abstracts of Scientific Articles

GEOLOGICAL RESEARCH IN THE WESTERN PACIFIC OCEAN

Kiev GEOLOGICHESKIY ZHURNAL in Russian Vol 38, No 3, 1978 pp 78-85

[Article by B. F. Zernetskiy, S. A. Kleshchenko, V. D. Burlachenko and V. A. Yemel'yanov, Institute of Geological Sciences, Ukrainian Academy of Sciences, "Results of Geological Research in the Western Equatorial Part of the Pacific Ocean During the Twelfth Voyage of the Scientific Research Vessel 'Akademik Vernadskiy'"]

[Abstract] The work program of the geology detachment on the 12th voyage of the research vessel "Akademik Vernadskiy" was devoted to a study of the bottom sediments of the Pacific Ocean along the track shown on the map.



The following conclusions were drawn on the basis of studies of bottom material from Singapore on the west to the shores of South America on the east. 1. It was established that the concentration of plankton foraminifera in the surface water layer is one or two orders of magnitude greater than in the layer from 6 to 30 m. At nighttime the quantity of foraminifera increases. 2. The areas of occurrence of plankton foraminifera in the

surface water layer do not correspond to the areas of occurrence of foraminifera encountered in the bottom sediments. 3. In the surface water layer there is a predominance of representatives of the genus *Globigerina*. 4. An important role is played by the plankton micromollusks *Pteropoda*, which here attain high concentrations. 5. The content of radiolarians is considerably greater than the content of plankton foraminifera. 6. In the surface layer it was not possible to find a single adult foraminifera. 7. In the region where bottom cores were taken, where the principal source of formation of sediments was representatives of the genera *Pulleniatina* and *Globorotalia*, the shells of these genera are not found in the water surface layer. 8. The highest concentrations of plankton foraminifera are noted in the Sulawesi Sea and in the western part of the Pacific Ocean. 9. High concentrations of plankton foraminifera are encountered in the Caribbean Sea.

[440]

MOTION OF THE EARTH'S CRUST IN THE OCEANS

Moscow ZEMLYA I VSELENNAYA in Russian No 2, 1978 pp 31-38

[Article by Corresponding Member USSR Academy of Sciences Yu. M. Pushcharovskiy, "Motion of the Earth's Crust in the Oceans"]

[Abstract] The article discusses the ocean floor as a dynamic region, mobile zones and tectonic movements beyond the limits of the mobile zones, as well as the development of extensive regions of tectonic destruction. A large map accompanying the text shows ocean regions differing in the nature of tectonic movements. The article describes three forms of manifestation of tectonic activity in the ocean. One of these led to the appearance and development of mobile oceanic zones with their complex geological history. Another form is related to regions of thalassogens where the tectonic movements in different parts have different directions. The third form is related to the development of destructive processes. The latter are associated with the marginal parts of the oceans, but can also be found in the central regions. In the Atlantic the largest regions of destruction lie in the west and north. The most important of these are situated in the broadest parts of the ocean and are associated with regions of development of island arcs. It has recently become clear that some marginal parts of the oceans are destructive regions of enormous extent. The similarity of configuration of the continents should not be given such importance as heretofore. Fragments of a modified continental crust are found in the internal regions of the ocean. This is a result of their complex movements. In order to explain the formation of the Atlantic or a considerable part of the Indian and Arctic Oceans it is necessary to envision a complicated picture of tectonic destruction. This is true because the earlier proposed mechanisms of simple continental drift, the subsidence of the continents or the hypothesis of plate tectonics do not explain the picture of complex geodynamics observed in these oceans.

[400]

IV. TERRESTRIAL GEOPHYSICS

Abstracts of Scientific Articles

DETERMINING ANGULAR ELEMENTS OF OUTER ORIENTATION OF STAR PHOTOGRAPH

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, GEODEZIYA I AEROFOTOS "YEMKA" in Russian No 1, 1978 pp 117-122

[Article by M. I. Shcherbakov, Moscow Institute of Geodetic, Aerial Mapping and Cartographic Engineers, "Determining the Angular Elements of Outer Orientation of a Star Photograph"]

[Abstract] In creating geodetic networks by the method of synchronous photography from space for studying the earth's surface using a topographic camera and studying stars with a star camera from an orbital observatory one of the principal problems is determination of the angular elements of outer orientation of the star camera, a problem already considered by Yu. M. Trunin (IZV. VUZov, GEODEZIYA I AEROFOTOS "YEMKA", No 6, 1970) and M. S. Urmayev (IZV. VUZov, GEODEZIYA I AEROFOTOS "YEMKA", No 4, 1976). The author briefly reviews the methods used by these authors and then demonstrates that it is preferable to use a direct method for determining the angular elements of outer orientation of the star photograph. Specifically, an operator is derived making possible transformation from the system for a star photograph to a system stipulated by stars, the basis for which is rotation theory.

[433]

MODERNIZATION OF PART OF ASKANIA GRAVIMETER

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 90, No 1, 1978 pp 53-55

[Article by K. Z. Kartvelishvili and O. K. Shoniya, Geophysical Institute Georgian Academy of Sciences, "Modernization of the Photoelectric Part of the 'Askania Werke' Gs-11 Gravimeter"]

[Abstract] The Askania Gs-11 gravimeter No 144 has been used at the Geophysical Institute Georgian Academy of Sciences since 1959. Recently the quality of the collected materials deteriorated sharply: there was a considerable

decrease in signal amplitude, noise appeared and the record became unsatisfactory. It was decided to modernize the instrument by replacing the selenium photocells by silicon photocells, at the same time replacing the original illumination lamp by a Soviet-produced lamp. The output signal of the Gs-11 increased by approximately 100 times and is now directly registered over a range of 5 MV, without an amplifier. The double amplitude record of the tidal wave is about 40 mm. After thermostat disconnection the gravimeter continues stable operation. In the USSR there is a considerable number of Askania Gs-11 gravimeters and the modifications described here are of interest for laboratories outfitted with such gravimeters.

[468]

COMPUTATION OF THEORETICAL SEISMOGRAMS FOR COMPLEXLY STRUCTURED MEDIA

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 240, No 5, 1978 pp 1062-1065

[Article by Corresponding Member USSR Academy of Sciences A. S. Alekseyev and B. G. Mikhaylenko, Computation Center Siberian Department USSR Academy of Sciences, "Method for Computing Theoretical Seismograms for Complexly Structured Models of Media"]

[Abstract] In this study a method is proposed for solving direct dynamic problems in seismics for complexly structured, horizontally inhomogeneous media. The method is based on the combining of finite integral transforms and finite difference methods. In earlier papers (A. S. Alekseyev, et al., IZV. AN SSSR, FIZIKA ZEMLI, No 12, 1970; DAN, Vol 235, No 1, 1977) in solving dynamic problems for vertically inhomogeneous media, for the purpose of reducing the spatial dimensionality of the problem use was made of the Fourier-Bessel transform with infinite limits. A reduced problem of lesser dimensionality was solved by finite difference methods for different values of the integration parameter in Fourier-Bessel integrals, after which the integrals were determined numerically. In this new paper, essentially a continuation of the earlier work of these two authors, in place of the integral Fourier-Bessel transforms use is made of their discrete analogues. This results in a considerable broadening of possibilities of the method of combining the approach of separation of variables with finite difference methods. In particular, it becomes possible to employ the method in problems for horizontally inhomogeneous media. In comparison with the variant of the method using integral transforms with infinite integration limits, in this case there is a considerable decrease in the volume of computations. Application of the method is illustrated.

[460]

SEISMIC ANISOTROPY OF CRUST AND MANTLE BENEATH OCEANS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 240, No 5, 1978 pp 1074-1077

[Article by Ye. M. Chesnokov and M. Baumbakh, Institute of Physics of the Earth, "Seismic Anisotropy of Crust and Upper Mantle Beneath Oceans"]

[Abstract] The anisotropy of the elastic properties in some regions of the oceanic upper mantle is now a demonstrated fact. Special experiments for studying seismic anisotropy in 22 regions of the world ocean have shown that the velocity of mantle longitudinal waves is periodically dependent on azimuth. The anisotropy coefficient changes in dependence on the region, attaining 10%. In this study, on the basis of a statistical analysis of the velocities of longitudinal waves obtained by the deep seismic sounding method, an attempt was made to estimate the mean effect of seismic anisotropy at the scales of the earth's crust and upper mantle under the oceans. A method for estimating the anisotropy coefficient is given. Table 1 gives the seismic anisotropy of the crust and mantle in the Pacific Ocean region. The presented data make it possible to conclude that there may be a seismic anisotropy in the upper mantle at the scale of the entire Pacific Ocean. For the crust, on the other hand, the anisotropy probably has a local character. Insufficient data are available for drawing any conclusions concerning anisotropy in the Atlantic and Indian Oceans.

[460]

CORRELATION BETWEEN ERRORS OF "OMEGA" RADIONAVIGATION SYSTEM

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, GEODEZIYA I AEROFOTOS "YEMKA" in Russian No 1, 1978 pp 30-34

[Article by V. T. Kondrashikhin and B. Lonchinski, Odessa Higher Marine Engineering School, "Correlation Between Errors of the 'Omega' Radionavigation System"]

[Abstract] One of the most promising systems for supporting sea and air navigation, geophysical surveys and other expeditionary studies in the open sea is the "Omega" radionavigation system. In addition to a determination of the mean square measurement errors it is necessary to devote particular attention to an investigation of the predictable corrections in dependence on illumination of the paths, solar activity, the geomagnetic field, local conditions and other factors. Various authors have noted that there is a correlation, in many cases very strong, between the measurement errors. This article is an experimental investigation of this correlation, which can be subdivided into two types: autocorrelation and cross correlation. The data used in the study were collected during a voyage of the Polish ship "Bronislaw Lakhovich" during docking at New York and Wilmington. The initial data are summarized in Table 1. Results of statistical processing show that the autocorrelation between errors of successive measurements attenuates very slowly. Averaging of series of continuous measurements results in virtually no increase in accuracy. Cross correlation also attenuates slowly and this also makes it difficult to increase the accuracy of position determinations. The results are regarded as preliminary and must be supplemented by further research.

[433]

BOTTOM STRUCTURE OF SOUTHWESTERN BALTIC SEA

Moscow SOVETSKAYA GEOLOGIYA in Russian No 4, 1978 pp 27-41

[Article by N. I. Sviridov and V. M. Litvin, Atlantic Division Institute of Oceanology, "Bottom Structure of Southwestern Part of the Baltic Sea"]

[Abstract] On the basis of data from continuous seismic profiling and dredging and drawing upon data obtained by other geological and geophysical methods, employing data for both the sea and land, the authors have examined the geological structure of the floor of the Southwestern Baltic. It was possible to compile schematic geological and tectonic maps of the region and cross sections. (Fig. 1 is a map showing the extent to which the region is studied; Fig. 2 is a series of cross sections; Fig. 3 shows the distribution of lithological and stratigraphic complexes; Fig. 4 is a map of dislocations in the layered structure of the sedimentary complex.) The sedimentary complex is represented by deposits of Cambrian, Ordovician, Silurian, Permian, Triassic, Jurassic, Cretaceous, Paleogene-Neogene and Quaternary age. The Permian, Jurassic and Paleogene-Neogene formations occur primarily to the south and southeast of Bornholm Island. In the Paleozoic and Mesozoic sedimentary complex there are numerous disjunctive and plicative dislocations and surfaces with an angular unconformity. In comparison with the other regions of the sea, the southwestern part has the most complex structure. This is attributable to the fact that it is associated with a zone of joining of three major structures: the Baltic shield, the Baltic syneclide and the Polish downwarp.

[481]

RELATIONSHIP BETWEEN UPPER MANTLE INHOMOGENEITIES AND TECTONICS

Moscow SOVETSKAYA GEOLOGIYA in Russian No 4, 1978 pp 51-64

[Article by I. A. Rezanov, All-Union Scientific Research Institute of Nuclear Geology and Geophysics, "Relationship Between Upper Mantle Inhomogeneities and Tectonics"]

[Abstract] A study was made of the structure of the earth's upper mantle under folded zones and platform territories. It is demonstrated that in the upper mantle there are two types of inhomogeneities: relict and newly formed. The first of these developed long ago and correlate with Riphean and Paleozoic structural plans. The second, considerably greater in extent, are situated under mountain zones and are genetically related to the stage of neotectonic activation. Relict inhomogeneities are caused by a change in the mineral composition of the rocks, whereas newly formed inhomogeneities are caused by their partial melting. Leaving aside the relict type, it is possible to define three principal models of the upper mantle associated with definite

types of geological structures. 1. Mantle of ancient platforms on the continents and in the ocean basins -- layers of reduced velocities are absent or thin. 2. Mantle of orogenic zones of the continents and mid-oceanic ridges -- thick layers of reduced velocities. 3. Mantle of geosynclines -- extensive steeply dipping layers of high-velocity matter extending to depths of 200-700 km and accompanied by earthquakes. Whereas the lifetime of the inhomogeneities in the second mantle type is some tens of millions of years, the lifetime of this type is hundreds of millions of years.

[481]

V. UPPER ATMOSPHERE AND SPACE RESEARCH

News

TASS ANNOUNCES LAUNCHING OF "KOSMOS-1024"

Moscow PRAVDA in Russian 29 Jun 78 p 2

[TASS Report: "Kosmos-1024"]

[Abstract] The artificial earth satellite "Kosmos-1024" was launched in the Soviet Union on 28 June 1978. The satellite was inserted into an orbit with the following parameters:

-- initial period, 12 hours 6 minutes;
-- apogee, 40,000 kilometers;
-- perigee, 630 kilometers;
-- orbital inclination, 62.8 degrees.

[464]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-1025"

Moscow PRAVDA in Russian 30 Jun 78 p 1

[TASS Report: "Kosmos-1025"]

[Abstract] The artificial earth satellite "Kosmos-1025" was launched in the Soviet Union of 28 June 1978. The satellite was inserted into an orbit with the following parameters:

-- initial period, 97.8 minutes;
-- apogee, 680 kilometers;
-- perigee, 649 kilometers;
-- orbital inclination, 82.5 degrees.

[465]

CHRONOLOGY OF "SALYUT-6" MISSION 15 JUNE - 5 JULY 1978

[Editorial Report] Moscow PRAVDA in Russian, dated 16 Jun 78 through 6 Jul 78 and IZVESTIYA in Russian 29 Jun 78, TASS provides the following information on activities aboard the manned "Salyut-6" space complex:

15 JUNE "SOYUZ-29" LAUNCHED

At 2317 hours Moscow time on 15 June 1978 the "Soyuz-29" was launched into near-earth orbit. The flight program for Commander Vladimir Vasil'yevich Kovalenok and engineer Aleksandr Sergeyevich Ivanchenkov envisages docking with the "Salyut-6" station and the continuation of experimentation begun on the complex by the crews of "Soyuz-26," "Soyuz-27," and "Soyuz-28." (PRAVDA 16 Jun 78 p 1)

16 JUNE

After a flight correction was made on the morning of 16 June, the orbital parameters of the "Soyuz-29" transport ship were:

- apogee, 314 kilometers;
- perigee, 270 kilometers;
- period of revolution, 90 minutes;
- orbital inclination, 51.6 degrees.

(PRAVDA 17 Jun 78 p 1)

17 JUNE "SOYUZ-29" -- "SALYUT-6" DOCKED

On 17 June 1978 the "Soyuz-29" docked with "Salyut-6" at the station's transfer compartment. The flight program for the manned space complex will include:

- studies of the earth's surface and atmosphere;
- astrophysical research;
- materials processing;
- biomedical examinations;
- and technical experiments to test the structure of the complex and on-board systems and equipment.

(PRAVDA 18 Jun 78 p 1)

19 JUNE

The orbital parameters of the "Salyut-6" -- "Soyuz-29" space complex were given as follows:

- apogee, 368 kilometers;
- perigee, 338 kilometers;
- period of revolution, 91.4 minutes;
- orbital inclination, 51.6 degrees.

During the working day (from 0800 to 2300 hours), Cosmonauts Kovalenok and Ivanchenkov conducted operations to restore the service of the station's on-board systems and scientific equipment as well as to conserve the systems of the "Soyuz-29" transport ship.

Using the "massometer," the cosmonauts began a series of checks on their body mass.

The parameters of the microclimate within the space complex were:

-- temperature, 20 degrees Celsius;

-- pressure, 780 mm Hg.

(PRAVDA 20 Jun 78 p 1)

20 JUNE

The "Soyuz-29" crew checked the windows of the station, the control panels of all scientific equipment and the flight control system in both the manual and automatic modes.

(PRAVDA 22 Jun 78 p 1)

21 JUNE

Cosmonauts Kovalenok and Ivanchenkov have completed operations to put into service the life support, power supply and temperature regulation systems of the station. They also continued to test on-board systems and equipment, worked with flight documentation and exercised. During the second half of the day they conducted a comprehensive examination of their circulatory systems.

(PRAVDA 22 Jun 78 p 1)

22 JUNE

The greater part of the day was devoted to medical experimentation. Cosmonauts Kovalenok and Ivanchenkov made use of the "Chibis" vacuum suits in their study of the reaction of the cardiovascular system to simulated hydrostatic pressure. Their body mass and circulation were also checked.

(PRAVDA 24 Jun 78 p 1)

23 JUNE

23 June marked the end of the first week of the "Soyuz-29" crew on board the orbital space complex. According to medical data, the crew had practically completed the period of adaptation to weightlessness. The pulse rate of Kovalenok was 60/minute, of Ivanchenkov -- 55/minute. Their blood pressures were 120/60 and 125/65, respectively.

The cosmonauts checked the "Kaskad" orientation system and, during the second half of the day, began the first technological experiment in the "Splav" apparatus.

(PRAVDA 24 Jun 78 p 1)

24 - 25 JUNE

For two days, in order to lessen the effects of dynamic disturbances while the "Splav" experiment was in operation, the space complex flew in a gravitational stabilization mode and the cosmonauts were given time for active rest. Thus, they worked with flight documentation, listened to music, put their quarters into order, relayed messages to their families, etc.

(PRAVDA 27 June 78 p 1)

26 JUNE

Cosmonauts Kovalenok and Ivanchenkov began work with the submillimeter telescope, testing the telescope itself and its cryogenic system as well.

(PRAVDA 27 Jun 78 p 1)

27 JUNE "SOYUZ-30" LAUNCHED

At 1827 hours Moscow time the second "international" crew was launched from the Soviet Union into near-earth orbit on board the transport ship "Soyuz-30." Petr Klimuk of the USSR was flight commander; Miroslaw Hermaszewski of Poland was the so-called "cosmonaut-researcher." Their flight program provides for docking with the "Salyut-6" -- "Soyuz-29" space complex and joint research with "Soyuz-29" cosmonauts Kovalenok and Ivanchenkov.

(PRAVDA 28 Jun 78 p 1)

28 JUNE

By 1600 hours Moscow time "Soyuz-30" had completed 14 orbits of the earth. Post-correction orbital parameters were:

-- apogee, 310 kilometers;
-- perigee, 264 kilometers;
-- period of revolution, 90 minutes;
-- orbital inclination, 51.6 degrees.

(IZVESTIYA 29 Jun 78 p 1)

"SOYUZ-30" -- "SOYUZ-29" -- "SALYUT-6" DOCKED

At 2008 hours Moscow time "Soyuz-30" docked with the "Salyut-6" -- "Soyuz-29" space complex at the assembly (equipment) bay. The seven-day flight program will include experiments on materials processing, earth sensing and biomedical studies.

(PRAVDA 29 Jun 78 p 1)

29 JUNE

Cosmonauts Kovalenok and Ivanchenkov joined Klimuk and Hermaszewski in their operations to unload the "Soyuz-30" transport ship and to shut down its on-board systems.

In accordance with the program of medical research, the cosmonauts conducted a study of their blood circulation using the "Polinom-2," the "Reograf," and the "Beta" devices. This experiment will make it possible to obtain information on blood redistribution and cardiac activity of man in space.

During the second half of the day, the crew began the joint Polish-Soviet materials processing experiment "Sirena" in the "Splav" apparatus. They were also engaged in physical exercise, photography and television reporting.

(PRAVDA 30 Jun 78 p 1)

30 JUNE

The schedule for 30 June included, besides exercise and an on-board press conference, medical experimentation by the cosmonauts. Using the "Chibis" vacuum suit and the "Polinom-2" device, cosmonauts Klimuk and Hermaszewski conducted a test of the reaction of their cardiovascular systems to simulated hydrostatic pressure; they also used the "Kardioldier," a special instrument developed by Polish scientists, to monitor their condition. Another experiment, developed in Poland, "Vkus" ("taste"), was also planned.

The "Sirena" materials processing experiment was continued as the cosmonauts monitored the operation of the "Splav" apparatus and the temperature regime of the on-going process.

(PRAVDA 1 Jul 78 p 1)

1 JULY

While cosmonauts Kovalenok and Ivanchenkov enjoyed a day of active rest, members of the international crew, cosmonauts Klimuk and Hermaszewski, were engaged in medical studies. They conducted the "Teploobmen" (heat exchange) experiment to compare their own personal sense of comfort with the index of a device designed to gauge the cooling properties of the environment. Throughout the day they exercised on the bicycle ergometer and used the "Kardiolider" to monitor their activity.

According to the medical data received, the pulse rate of Klimuk was 75/minute, of Hermaszewski -- 55/minute; their blood pressures were 120/70 and 125/60, respectively.

(PRAVDA 2 Jul 78 p 1)

The joint Polish-Soviet "Sirena" experiment (to process a cadmium-mercury-tellurium semiconductor under weightlessness conditions) was completed.

(PRAVDA 3 Jul 78 p 1)

2 JULY

Cosmonauts Kovalenok, Ivanchenkov, Klimuk and Hermaszewski conducted observations of the earth's surface and, with the MKF-6M multispectral space camera, photographed various regions of the European USSR, of Kazakhstan and of the world's oceans.

Physical exercise, television reporting and photography of aurora borealis were included in the day's flight program.
(PRAVDA 3 Jul 78 p 1)

3 JULY

The "Salyut-6" -- "Soyuz-29" -- "Soyuz-30" space complex was in an orbit with the following parameters:

-- apogee, 360 kilometers;
-- perigee, 336 kilometers;
-- period of revolution, 91.2 minutes;
-- orbital inclination, 51.6 degrees.

After breakfast and a check of the on-board systems of the space station, cosmonauts Klimuk, Hermaszewski, Kovalenok and Ivanchenkov continued their research program. Besides doing physical exercise, photographing the earth's surface and preparing a television report, they conducted an experiment to study the metabolism using biological indications within the blood. Yet another materials processing experiment was made in the "Splav" apparatus.

(IZVESTIYA 4 Jul 78 p 4)

4 JULY

In preparation for the return of the "Soyuz-30" crew, the cosmonauts tested the flight and propulsion systems of the transport ship and transferred exhausted equipment into the crew compartment and exposed film, correspondence, inserts with fixed biological subjects and capsules containing materials obtained in "Splav" experiments into the descent vehicle.

Other activities included physical exercise, television reporting and studies of the atmosphere and microflora within the space station.

(PRAVDA 5 Jul 78 p 2)

5 JULY

On 5 July at 1315 hours Moscow time "Soyuz-30" separated from the "Salyut-6" space station. Cosmonauts Klimuk and Hermaszewski soft-landed in its descent vehicle 300 kilometers west of Tselinograd.

(PRAVDA 6 Jul 78 p 1)

All of the TASS statements indicated that the cosmonauts were well and that all systems were functioning normally. TASS information on flight activities for 19 June was not published in the Soviet press.

[5]

RYCHLEWSKI SUMMARIZES POLISH PARTICIPATION IN SPACE RESEARCH

Moscow IZVESTIYA in Russian 1 Jul 78 p 5

[Article by Jan Rychlewski: "Penetration into Space"]

[Excerpt] Today space is an arena of vigorous scientific and technical activity directed to the solution of global scientific and practical problems. On the initiative of and with the support of Soviet scientists, the scientists of the socialist cooperation countries have been gradually drawn into this work.

More than ten years ago we shifted from optical observations of the first artificial earth satellites to a complex program of joint space research which was given the name "Interkosmos." Now we can say that much work has been done during this period. It was possible to obtain first-class results in the field of space physics, space meteorology, space biology and medicine, space communications and studies of the earth have been made from orbit. In actual practice there has been testing of such forms of joint work as the launching of space vehicles for scientific and practical purposes, development of on-board and surface apparatus, joint observations, experimental and theoretical investigations, joint processing, analysis and use of the experimental data received from space.

Polish science is also participating in this brotherly and businesslike cooperation. Immediately after the historic launching of the first satellite, 11 observation stations were organized in the territory of our country. The collected data were highly praised by our Soviet colleagues. Later research groups of our physicists, astrophysicists, meteorologists, physicians and communication specialists were gradually joined to the work.

Later in the field of space physics, using "Vertikal" rockets and satellites of the "Interkosmos" series, Polish scientists carried out experiments for studying the ionosphere and interaction between cosmic rays and matter, as well as study of different aspects of solar-terrestrial relationships. Interesting results were obtained using an x-ray spectroheliograph raised aboard a rocket. A Cracow team of physicists, headed by the Vice President of the Polish Academy of Sciences, M. Mensovich, actively participated in the experiments for investigating nuclear interactions at high energies, carried out using nuclear photoemulsions on the heavy satellite "Interkosmos-6." A significant measure of Polish science was the preparation for and implementation, in cooperation with Soviet scientists, of an original scientific program for the satellite "Interkosmos - Kopernik-500." The purpose of the program was an investigation of solar radioemission and the parameters of the earth's ionosphere. The instrumentation developed and fabricated by Polish and Soviet scientists operated faultlessly considerably longer than the computed time. Extensive information was obtained and processed concerning fifty or more solar radioemission bursts and a clearly irregular structure of individual bursts was discovered. The "responses" of solar phenomena in ionospheric plasma were investigated. It was possible to register Jovian radioemission.

The launching of the "Copernik-500" from a Soviet cosmodrome was dedicated to the 500th anniversary of the birth of our great countryman Copernicus, honored by all progressive humanity. I would like to emphasize the special role of Soviet scientists in the preparation of the experiment and the assistance of Czechoslovakian specialists.

This example clearly illustrates the businesslike and fraternal nature of cooperation within the framework of the "Interkosmos" program. Clearly organized collective efforts afford the possibility for each country to make a contribution corresponding to its capabilities, specialization and interests. On this basis it was possible to create such complex instruments as, for example, laser satellite range finders, developed by Hungarian, German, Polish, Soviet and Czechoslovakian scientists and specialists. The universal electron counter developed in Poland affords a possibility for measuring the travel time of a laser beam to a satellite and back with an accuracy to two billionths of a second.

Our physicians are taking an active part in study of the central problem in space physiology -- the influence exerted on the human body by spaceflight factors, especially weightlessness. In a wide range of studies specialists investigated different effects of the influence of hypokinesia and oxygen inadequacy. The results obtained in the field of space medicine are of independent importance for aviation medicine, radiobiology and psychology.

From the very beginning we have assigned great importance to the practical applications of the results of space research. Studies in the field of space physics have made it possible to prepare monthly radio forecasts for individual radio paths and provide daily information on communication conditions. Satellite data are taken into account in weather forecasting. A satellite communications station is in successful operation; it interacts with Soviet satellites of the "Molniya" series within the framework of the "Intersputnik" system. Increasing use is being made of the results of space geodesy. Data from remote sounding of the earth from orbit are coming into use in an investigation of our natural resources and in environmental protection problems.

The Soviet space program is attracting the most careful attention from the international scientific community, which takes note of its good planning, step-by-step progress and clear definition. The "Interkosmos" program has these same characteristics and is being constantly enriched and developed. Now we are witnesses of and participants in a fundamentally new stage in the joint work: a participation, on the basis of a proposal of the Soviet Union, in international manned space flights. With satisfaction we have noted the successful execution of the first flight under this program by a Soviet-Czechoslovakian crew.

The implementation of the entire "Interkosmos" program, and especially the international manned flights, became possible due to the truly fraternal, high-spirited and disinterested relationship with the Soviet Union, which

without expecting anything in return, makes available all its fabulous rocket and space technology.

We are greatly excited and proud that a fellow countryman, the first Polish cosmonaut M. Hermaszewski, has gone to work aboard the space research complex "Salyut-6"--"Soyuz-29"--"Soyuz-30" as a member of the international crew.

We express high recognition to the personnel of the Cosmonaut Training Center imeni Yu. Gagarin for the benevolence and work which they invested in the training of our fellow countryman for participation in executing the interesting and complex scientific and technical program of the flight, conceived by Soviet and Polish scientists.

On the threshold of the holiday honoring the rebirth of Poland our people are perceiving the international space flight with the participation of a citizen of the Polish People's Republic as an event which follows logically from the entire path covered by the country during the years of popular rule and as a bright manifestation of fraternal Polish-Soviet friendship.

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RENDEZVOUS AND DOCKING OF "SOYUZ-30"

Moscow PRAVDA in Russian 29 Jun 78 p 6

[Article by V. Gubarev and A. Pokrovskiy: "The Path to 'Salyut'"]

[Text] Their path to the "Salyut-6" was long and difficult. This can now be seen particularly clearly now that the goal is close. The "Soyuz-30" is completing the approach to the orbital complex...

The program required "time for sleep." Petr Klimuk laid down on the ceiling, put his palm under his cheek and closed his eyes. And M. Hermaszewski looked through the window at the earth.

"It is necessary to sleep," reminded Klimuk, "it has been a difficult day behind us, but tomorrow will be no easier."

"This is my first day," said Miroslaw smiling. "Perhaps it is necessary to lay down and sleep at once?"

"It is, Miroslaw," insisted Klimuk, "Get yourself together..."

As provided for, both cosmonauts fell to sleep deeply, without dreams. But in the morning they again established communication with the Center. And their voices sounded clearly and in a businesslike manner.

"It is pleasant to work with the crew," comments USSR Flier-Cosmonaut Hero of the Soviet Union Ye. Khrunov. "Without question, Klimuk's experience is making itself felt. The psychological load immediately after separation of the ship from the carrier is enormous. During the first encounter with weightlessness the emotions run high. And it is necessary to work. When there is an experienced commander in the crew he helps his comrade to adapt more quickly, and like Petr Klimuk, immediately helps his colleague in checking the ship's systems, and from the very first phrase between the Control Center and the ship, establish complete understanding."

Already on the first revolution Klimuk and Hermaszewski checked the operation of the "Igly," that is, the search and approach system. Two hours after the launching the crew began to prepare the "Soyuz" for the first maneuver. Their actions on the first day of flight were highly praised by the "oldtimers" in space, who in each communications session were interested: "And how go things with the 'Kavkazy'?"

"They have a good orbit," reported the Center operator to the "Fotony."

"It is very pleasant to interact with such lads as Petr and Miroslaw," said Vladimir Kovalenok.

"Transmit to them again," added Aleksandr Ivanchenko, "that we are waiting with impatience. Our home is already prepared for the meeting."

The moment is approaching for the culminating moment of the first stage in the flight -- docking. On the enormous screen at the Control Center one can see the appearance of a tiny hand-made star; it grows, gradually filling the entire screen. It will be exciting to participate directly in the docking.

"In actuality," agrees Twice Hero of the Soviet Union USSR Flier-Cosmonaut Vitaliy Sevast'yanov, who in his time made a flight together with the present commander of the "Soyuz-30," "here it is more exciting than when you are at the ship controls. There you are simply never excited. All your attention is absorbed by the approach process."

In this operation the cosmonauts are actively assisted by the Control Center.

"Fotony!" calls the earth to the "Salyut-6" crew. "Enter into communication only in the event of extreme necessity. Now the priority is for the 'Soyuz-30'. Listen to their report."

"The velocity is four-tenths of a meter per second," sounds Klimuk's calm voice through the loudspeaker. "Distance to the station -- 50 meters."

And finally we hear: "Docking has occurred!" It seems that this was simultaneously exclaimed by both crews -- from aboard the station and from aboard the ship. Now begins the mechanical coupling of the station and the ship,

the connection of the electric plugs and all those processes which transform the two celestial bodies into a single unit. Most of these operations occur outside the limits of the Center's radio visibility.

And then in the next communication contact the conversation is with the triple scientific research complex "Soyuz-29"- "Salyut-6"- "Soyuz-30." It is true that the station is still separated from the "Soyuz-30" by the transfer hatches. The earth must give the command for opening them after a careful checking of the tightness of joining of the docking unit.

"Permission is given for opening the transfer hatches!" is finally heard through the loudspeaker system. The television camera shows how impatiently Vladimir Kovalenok and Aleksandr Ivanchenkov listen to the course of the work. Probably these last seconds prior to the meeting seem to them to be particularly long.

Finally the hatch swings open slowly and the smiling Petr Klimuk and Miroslaw Hermaszewski float into the station.

"Welcome to our common home," say Vladimir Kovalenok and Aleksandr Ivanchenkov in welcome, "make yourself at home."

"The parade of joint flights of citizens of the socialist countries for the peaceful mastery of space is successfully continuing."

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REPORT ON "SOYUZ-30" DOCKING

Moscow IZVESTIYA in Russian 30 Jun 78 pp 1, 2

[Article by B. Konovalov: "Handshake Above the Planet"]

[Text] The stage of distant approach and docking is swift; it occupies only a day and in essence begins immediately after the transport ship enters into orbit.

On the fourth revolution of the "Soyuz-30" on 27 June Miroslaw Hermaszewski for the first time could admire the evening lights of his country's cities when the ship passed over Wroclaw, where he once had learned to fly in gliders, Wolow, where he spent his childhood, and over the capital of Poland, Warsaw. And already on the next revolution, the fifth, he and Petr Klimuk carried out the first two-impulse maneuver for transfer into an assembly orbit.

On 28 June, on the 17th revolution, the "Kavkazy," Klimuk and Hermaszewski, fired the engine twice more and transformed the orbit of their ship into an almost circular orbit. The "Fotony," Kovalenok and Ivanchenkov, this time

turned their "Salyut-6"--"Soyuz-29" complex with the stern toward the approaching "Soyuz-30." The free docking unit of the station was ready to receive a new ship.

"We see a light spot," reports Klimuk.

"You are observing the station," confirms the duty operator "Zarya" from the earth, cosmonaut Valeriy Rozhdestvenskiy.

Klimuk conducts a clear report on all the operations of the automatic system. From time to time Hermaszewski in a calm, sure voice reports on the fuel expenditure.

The light dot gradually increases in size, assuming the familiar configuration of the "Soyuz." The ship is flying somewhere to the north of the Caspian Sea and is beautifully seen against the background of the clouds and distant earth.

"We are awaiting contact!" says Klimuk.

"Contact has taken place! Interception!"

"We congratulate you, 'Kavkazy'," says the earth.

At 20 hours 7 minutes 50 seconds Moscow time the "Soyuz-30" arrived at the station of designation.

Now an unhurried process of joining of the electric and hydraulic systems and the checking of the tightness of the contact is in progress in space. This will continue during two around-the-world journeys of the cosmonauts and the journalists have time in order to speak with scientists and specialists.

"The general program of the socialist countries, known as 'Interkosmos,'" says Academician B. Petrov, Chairman of the "Interkosmos" Council of the Presidium USSR Academy of Sciences, "has entered into a new and productive phase: the stage of manned flights is in progress. Now the second international crew, this time including a citizen of the Polish People's Republic, Miroslaw Hermaszewski, is proceeding to work aboard a real complex laboratory and is beginning to carry out an extensive research program having not only scientific, but also great practical importance for the fraternal socialist countries."

Many times we held discussions with the Chairman of the Space Research Committee of the Polish Academy of Sciences, Professor J. Rychlewski, in Warsaw, at the cosmodrome and here at the Flight Control Center.

"The development of space research in Poland," he says, "is based on the fraternal assistance of the Soviet Union, which without strings provides the socialist countries with rockets, satellites, ships, and surface flight

support complexes. Our duty is to participate in the general program as a good partner. At the cosmodrome a member of the Politburo of the Central Committee of the Polish Communist Party, the Minister of National Defense of the Polish People's Republic, W. Jaruzelski, spoke the beautiful words: "During the war you shared bread and guns with us, and now you are sharing space with us. Many thanks to you for this."

The television camera of the "Salyut-6" shows us Vladimir Kovalenok and Aleksandr Ivanchenkov, who with impatience are awaiting their guests. Now the transfer hatch is raised and Miroslaw Hermaszewski floats into the "Salyut" directly into the embrace of his friends and behind him appears the happily smiling Klimuk.

"Here, if you please, is our 'bread and salt'," says Kovalenok, showing the guests the polyethylene containers which contain tiny space loaflets.

Miroslaw Hermaszewski greeted his friends in Polish and in Russian.

"Our feelings and mood can now best be expressed with a simple gesture," says Ivanchenkov. And all four clasp arms in a unified fraternal embrace.
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COMMENTS ON "SIRENA" EXPERIMENT ABOARD "SALYUT-6"

Moscow IZVESTIYA in Russian 1 Jul 78 p 3

[Article by B. Konovalov: "Space 'Siren'"]

[Text] When the first Polish cosmonaut, Miroslaw Hermaszewski, was put into orbit, the 35th million inhabitant was born in Poland. And among these 35 million (the entire population of the country) about 300 thousand are employed in the sphere of science, higher education and technology. The country of Copernicus is honored for its scientific traditions and is continuing to grow vigorously in its scientific and technical potential. Space research is assuming a more and more important role.

A special Space Research Center was recently organized in the system of the Polish Academy of Sciences. The efforts of individual groups will be concentrated there. An All-Polish space research program has been drawn up and is now attracting to its work many strong academic institutes of the Polish Republic. In the implementation of the space program of the Polish People's Republic there are about 50 scientific institutes of different departments which are participating; these include many colleges.

"Poland is extremely interested in the development of space research and during recent years there has been a marked intensification in this field," says the Chairman of the Space Research Committee of the Polish Academy of

Sciences J. Rychlewski. "We understand beautifully that now this is vitally necessary for us. It is especially important that now we can work in the principal direction in cosmonautics -- making use of the unique possibilities of space research on an orbital station. On the very forefront of science the "stellar fellowship" of the socialist countries is giving the entire world an example of the fraternal relationships among peoples. Today's flight is a prototype of how all work of different countries will be organized in such a planetary-wide undertaking as the mastery of space.

During the work of the international crew aboard the space complex a whole series of joint Soviet-Polish experiments will be carried out. The technological experiment "Sirena" was started on the evening of 29 June. It was prepared by a group of Polish and Soviet specialists.

The cosmonauts inserted into the "Splav-01" furnace a number of ampules with the initial materials for cultivation of valuable semiconductor monocrystals. In one of these was the triple compound "cadmium-mercury-tellurium" and in the other there was a "cadmium-mercury-selenium" compound. In this experiment the scientists want to test different technological methods for obtaining semiconductor monocrystals. In the first ampule the initial substances will be melted and then subjected to regulated cooling in accordance with a definite program. In the second ampule the crystal should grow, gathering material from the surrounding gas medium.

During the time of execution of the "Sirena" experiment the cosmonauts put the orbital complex into a drift regime during which all the engines of the orientation system were shut down so that the residual acceleration would be minimum and would exert no influence on the course of the technological process. And during the time of crystallization even physical exercises on the treadmill and bicycle-type ergometer were forbidden.

The sirena is the symbol of Warsaw and an adornment of the coat of arms of that city and gave its name to the experiment, which has not only scientific, but also practical importance. In Warsaw we talked with the Director of the Physics Institute of the Polish Academy of Sciences Professor E. Kolodeichak and the experiment director R. Halonska.

Under weightlessness conditions we hope to grow crystals with such a degree of homogeneity, they said, as is very difficult to achieve under terrestrial conditions. The semiconductor materials selected for the experiment are extremely valuable for IR technology, now employed in the national economy. For example, from these it is possible to make detectors for IR telescopes which are capable of unraveling many secrets of the universe; they can be used for laser communications or for investigating the atmospheric contamination of our planet, and for use in thermal (IR) detectors, which in the earliest stages will make it possible to detect many diseases and to obtain new possibilities for the development of optoelectronics and computers.

Space is a very special medium which is exceedingly attractive for the technological purposes of producing many unique materials. And unquestionably as time passes it will be used on a broad scale. Now is just the beginning, the exploration of valuable possibilities. To be sure, it is desirable that Poland be able to use these unique possibilities when the scales of production in space acquire an industrial character. And for this it is necessary to work today, combining the efforts of all the fraternal countries.

Aboard the space complex the new international crew has taken up the research load of the earlier expedition. The cosmonauts carried out the "Kislorod" experiment ["Oxygen" experiment] using a unique portable instrument known as the "oxymeter," developed by Czechoslovakian specialists. Using this instrument it is possible to study the nature of oxygen consumption by the human tissues, to clarify whether there is a change there in the content of this "gas of life" under spaceflight conditions. This is important for determining the energy expenditures of the body, prediction of the work capability of the cosmonaut. The investigations initiated by A. Gubarev and W. Remek will now be continued.

In greeting the international crew of the "Salyut-6"- "Soyuz-29"- "Soyuz-30" orbital complex, Leonid Il'ich Brezhnev and Edward Gierek emphasized that the current international flight "...has great scientific and technical importance, clearly embodies our many-sided cooperation, demonstrates the great force and possibilities of socialist internationalism." And the work which is developing at space altitudes has made the correctness of these words conspicuous for the entire world.

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VERESHCHETIN COMMENTS ON POLISH CONTRIBUTION TO "INTERKOSMOS" PROGRAM

Moscow PRAVDA in Russian 1 Jul 78 p 6

[Article by V. Vereshchetin: "Space Relay"]

[Text] A fragment of a facsimile edition of a book by Nicolaus Copernicus entitled "On the Revolution of Celestial Spheres" and a reproduction of a drawing of the solar system from this book are being carried aboard the space complex "Salyut-6"- "Soyuz." They were taken on this flight by the first Polish cosmonaut Miroslaw Hermaszewski. This fact is symbolic. Polish science has long and glorious traditions. The entire world knows the names of remarkable Polish scientists -- Nicolaus Copernicus, Johannes Hevelius, Maria Sklodowska Curie, and many others.

The name of Copernicus was assigned to the ninth satellite of the "Interkosmos" series, which was launched in 1973, when there was celebration of the 500th anniversary from the birth of the great astronomer. Using the scientific instrumentation designed and fabricated in the Polish People's Republic,

carried aboard the "Interkosmos-Kopernik-500" satellite, it was possible to measure the spectral characteristics of sporadic solar radioemission.

The investigation of our sun is one of the traditional directions in the work carried out by the scientists of the Polish People's Republic within the framework of the "Interkosmos" program. The Polish scientific instrumentation for study of the sun was carried aboard the "Vertikal'-1" and "Vertikal'-2" rockets. The scientists of the fraternal country are making a weighty contribution to the complex investigation of solar UV-, X- and microwave radiation.

Also well known are the achievements of Polish science in the study of primary cosmic rays with high energies. During the flight of the "Interkosmos-6" satellite there was checking of an original method proposed by the scientists of the Polish People's Republic. The processing of the results of this experiment by a group of Cracow physicists from the Institute of Nuclear Physics has demonstrated the excellent possibilities of study of nuclear reactions during prolonged exposure of plates covered with photoemulsion in space.

Specialists of the Polish People's Republic actively participated in the creation of the "Interkosmos" laser range finder, making it possible with a high accuracy to determine the distance to the satellites. Representatives of space biology and medicine gave a high evaluation to the work done by the Warsaw Institute of Aviation Medicine. With the participation of Polish scientists and specialists there was implementation of interesting investigations in the field of space geodesy, meteorology and space communications, and study of the earth's natural resources.

The flights of international crews with the participation of the cosmonauts of the socialist countries are a natural development of the "Interkosmos" program. Over a period of 11 years there has now been successful implementation of the scientific and practical work by groups of scientists from Bulgaria, Hungary, German Democratic Republic, Mongolia, Poland, Romania, the USSR and Czechoslovakia. During the years which have passed in the five principal fields of joint work (space physics, communication, meteorology, biology and medicine, study of natural resources of the earth from space) many valuable results have been obtained.

The high scientific and technical level and constant broadening of the scales of joint work, the carrying out of increasingly more complex experiments requiring the use of diverse types of rocket and space technology, naturally led to the participation of the citizens of the other socialist states in investigations on Soviet ships and orbital stations and attracted the scientists and specialists of these countries to the preparation of complex experiments in space.

The flight of the first international crew under the "Interkosmos" program took place during the period 2-10 March 1978. The "Soyuz-28" delivered to the "Salyut-6" station the USSR flier-cosmonaut A. Gubarev and a citizen

of the CzSSR W. Remek. They, together with the cosmonauts Yu. Romanenko and G. Grechko, successfully carried out a planned program for investigations and experiments.

The faultless operation of large groups of specialists in the creation of complex and improved technology and its control made it possible to continue reliably the launching of the next international crews.

In the planning of both the general research program for international crews and experiments for each specific flight provision was made for their multi-sided character and successive nature. A repetition of several experiments will make it possible to obtain more reliable results, accumulate statistical data, ascertain both the individual peculiarities and general patterns of the studied phenomena. At the same time, in each successive flight the experimental program is being expanded and specialists of an ever-greater number of countries are being drawn into the preparation of research for international crews. This is a component part of the general program for many-sided cooperation. For example, in the preparation of the experiments for the international flight now being carried out there was participation of scientists and specialists of the Soviet Union, Poland, German Democratic Republic and Czechoslovakia.

During recent years there has been increasing interest in technological experiments in space. Specialists regard this direction in research to be extremely promising and expect that with time they will lead to the organization of space production of new materials with properties unattainable in space. The international crew aboard the "Salyut-6" station will use the Soviet "Splav" apparatus for carrying out the "Sirena" experiment for studying the processes of growth of semiconductor crystals proposed by Polish scientists. This experiment is becoming a logical continuation of the Soviet-Czechoslovakian technological experiment "Morava."

The complex of biomedical experiments is extremely extensive. Most of them were proposed and prepared by scientists and specialists of the Polish People's Republic or with their participation.

The flight of the Polish cosmonaut is clear evidence of the successes of integration of science in the socialist countries. This year plans call for the launching of the third international crew, which is to include a citizen of the German Democratic Republic. At the Cosmonaut Training Center imeni Yu. A. Gagarin there are exercises and training sessions for the following group of cosmonaut candidates -- representatives of Bulgaria, Hungary, Cuba, Mongolia and Romania; in the future these will also make flights in Soviet spaceships and orbital stations.

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MEDICAL EXPERIMENTS DOMINATE FLIGHT PROGRAM OF "SOYUZ-30"

Moscow IZVESTIYA in Russian 4 Jul 78 p 4

[Article by B. Konovalov: "Man and Weightlessness"]

[Excerpt] The fact is that the principal direction in the work of the new international crew aboard the "Salyut-6"- "Soyuz-29"- "Soyuz-30" space complex is specifically experiments in the field of space medicine.

"Have you carried out the 'Vkus' experiment?" asks the earth with interest in one of the radio communication contacts.

"We have done so," answers P. Klimuk. "Before and after the partaking of food. We will continue this during dinner and supper."

As a result of the general restructuring of the body, which begins in orbit, there is a change in the customary sensing by the organs of taste. Acidic food, for example, no longer seems so acidic as on the earth. That which had seemed tasty no longer seems tasty. This has been noted by many cosmonauts and Polish scientists decided to create a special instrument, the "Elektrogustometer" [Electric taste meter], for investigating changes in taste sensations in flight.

"In this experiment we wish to explain clearly," we were told in Warsaw by the chairman of the Commission on Space Biology and Medicine of the Space Research Committee of the Polish Academy of Sciences Professor Stanislaw Baranski, "whether taste changes are related to the psychological sphere or are independent of it. The research principle is simple: a cosmonaut, applying an electrode to his tongue, gradually increases the current strength. When he begins to experience 'nipping,' at this moment the digital readings of a hand instrument are registered. By comparing the threshold of in-flight sensitivity with measurements on the earth we can quantitatively estimate the changes caused by space conditions."

Weightlessness introduces the most significant changes in the cosmonaut body in the cardiovascular system. Immediately after emergence into orbit there is a redistribution of blood in the body and the cosmonauts begin to sense its flow to the head. Therefore, the first medical experiments which Klimuk and Hermaszewski began to carry out aboard the "Salyut-6" were complex investigations of the circulatory system using different kinds of instrumentation.

In the flight reports we have written several times that the cosmonauts are wearing a special "Chibis" suit, especially in a period before landing so that for some time there will be a simulation of terrestrial gravity and so that blood will flow into the lower half of the body. The "Chibis" suits are a kind of airtight corrugated breeches in which there is rarefaction and due to this the blood is driven downward.

On this flight Klimuk and Hermaszewski for the first time wore the "Chibis" suit during the adaptation period. In the "Komfort" experiment they had to clarify the effect of simulation of terrestrial gravity at the beginning of the flight, whether there would be unpleasant sensations of discomfort such as all cosmonauts experience during the adaptation period. At the same time in this experiment there was also testing of the "Kardiolider" instrument developed by specialists of the Military Institute of Aviation Medicine of the Polish People's Republic and constructed at the x-ray apparatus and medical devices plant in Warsaw.

The operation of this instrument is based on an analysis of the dynamics of the frequency of cardiac contractions using the bioelectric currents of the heart which are registered using electrodes. This is a very compact, convenient instrument which weighs only 200 grams and which makes it possible to monitor the heart beat in a wide range -- from 60 to 180 beats per minute.

During the experiment the cosmonaut puts on this instrument and thereafter, as usual, operates in accordance with a program. If during presence in the "Chibis" suit everything goes normally, the instrument is silent, but if the heartbeat exceeds a definite threshold the "Kardiolider" emits a signal and the cosmonaut must reduce the degree of rarefaction or suspend the experiment.

The "Kardiolider" was tested during the time of training sessions on the cosmic velocipede, the bicycle-type ergometer, and on the "treadmill," the complex on-board physical trainer.

"We regard these experiments as a first step," we were told at Warsaw, at the Military Institute of Aviation Medicine by Professors Baranski and Sokolovski. "Henceforth it will be possible to combine the 'Kardiolider' with a portable controlling computer and assign it a definite program for tracking the level of the physical load. Upon instructions from the 'Kardiolider' the machine can automatically increase the rate of treadmill movement if the cosmonaut is listlessly performing exercises, or reduce it if the cosmonaut is overdoing it. This makes it possible to carry out prolonged exercises with a carefully monitored load."

Each day the international crew fills out a special log or diary which was prepared jointly by Soviet and Polish specialists. This will assist psychologists in evaluating the influence of different factors accompanying orbital flights on the feeling of well-being and on the performance of cosmonauts.

After all, it is important to have not only the objective readings of medical instruments, but also the subjective sensations of cosmonauts.

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PRAVDA REPORTS ON PRESS CONFERENCE ON "SALYUT-6" MISSION

Moscow PRAVDA in Russian 8 Jul 78 p 4

[TASS Report: "New Heights of 'Interkosmos'"]

[Editorial Report] A press conference held in Moscow on 7 July 1978 for Soviet and foreign press representatives was devoted to a discussion of the recently completed Soviet-Polish "Salyut"--"Soyuz" expedition. The meeting, chaired by V. Sofinskiy, chief of the press section of the USSR Foreign Ministry, involved prominent Soviet and Polish scientists and diplomats, including, in particular, Academician B. Petrov (Chairman of the "Interkosmos" Council), Professor J. Rychlewski (Chairman of the Polish Academy of Sciences Space Research Committee) and cosmonauts P. Klimuk and M. Hermaszewski.

Both Petrov and Rychlewski praised the accomplishments of the Soviet-Polish international crew and attributed its success to the close cooperation of the two nations represented in the field of space research and to the "disinterested assistance of the Soviet Union, which places at the disposal of the socialist countries its magnificent space equipment." Cosmonauts Klimuk and Hermaszewski continued in much the same vein, expressing gratitude to the many specialists involved in their flight. According to the report, they also gave a detailed account of the scientific, technological and biomedical experiments performed on board the "Salyut-6" space station, although no such details were published. [5]

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INDIA'S FIRST COMMO SATELLITE LAUNCHING PREDICTED

Moscow TASS in English 1955 GMT 3 Jul 78

[Text] Delhi, 3 July. TASS. TASS Correspondent Igor Kolganov reports:

"The Soviet Union renders India and other developing countries unselfish aid in the sphere of space exploration, promoting the acceleration of their socioeconomic progress," stated the Indian delegate Yashpal at the 21st session of the UN Committee for the Utilization of Space for Peaceful Purposes.

The Indian press unanimously notes that India's successes in space exploration would have been unthinkable without close cooperation with the Soviet Union. A vivid example is the launching of India's first artificial earth satellite "Ariabatha" in April 1975 by a Soviet carrier rocket from USSR territory. By now the Indian satellite has made about 17,200 revolutions and is functioning normally.

Soviet scientists and specialists have given vigorous assistance in preparing for the launching of the second Indian satellite, whose engineering model passed all trials at India's space center. It will provide Indian scientists with valuable information on their country's mineral reserves and the riches of the continental shelf of the ocean, on hydraulic resources and the state of the snowcap in the Indian Himalayas. Data on space research are of invaluable practical importance for the development of the national economy, first of all. In 1980 India will put its first communications satellite into terrestrial orbit, which will open up broad prospects for developing the country's communication system.

Thanks to the joint work by Soviet and Indian scientists in space exploration, the skill of Indian research personnel increased to a point where they can tackle complicated scientific and technical space exploration tasks on their own. The implementation of the new space experiment will further strengthen friendship and cooperation between the two countries.

[490]

FEOKTISTOV ADVANCES CONCEPT OF MODULAR SPACE SYSTEMS

Moscow PRAVDA in Russian 6 Jul 78 p 6

[Article by A. Pokrovskiy: "Separating and Meeting"]

[Excerpt] "The advantages of orbital complexes is obvious," adds USSR Pilot-Cosmonaut Professor K. P. Feoktistov. "They can act as a prototype for future industrial enterprises in space by demonstrating the usefulness of the principle of modular construction. It is possible to imagine that, similar to the way in which manned transport and automatic freight ships are now docked to a space station, interchangeable modules with improved or new equipment will be moored with a basic space enterprise unit or an orbital laboratory according to rising demands." [5]

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LANDING OF "SOYUZ-30" DESCRIBED

Moscow TRUD in Russian 6 Jul 78 p 3

[Article by Yu. Kotlyarov: "Meeting in the Turgayskaya Steppe"]

[Text] While still in the air over the Turgayskaya steppe, Petr Klimuk transmitted from the descent module of the "Soyuz-30" ship:

"We feel well. We are making ready for the landing..."

The commander of the star ship is familiar with the local terrain. Three years ago, also in July, he was a part of the "Soyuz-18" crew, which landed not far from the present-day landing site. At that time he was accompanied by Vitaliy Sevast'yanov, and now by the Polish cosmonaut-researcher Miroslaw Hermaszewski.

"Altitude 3,000 meters," reports the ship to the search service.

Yesterday on the way to Arkalyk our aircraft flew at the same altitude. Downward from horizon to horizon we could see the rectangles of green grain fields alternating with the rusty expanses of solonchaks. Now the grains and grasses are in their glory. Now the "Kavkazy" can look down on this from above. Aleksey Arkhipovich Leonov discussed this with me.

"Returning from space, we unfortunately cannot see this beauty," responded the Deputy Chief of the Soviet Cosmonaut Training Center. The windows of the descent module are so enshrouded in flame, roaring around it during entry into the dense layers of the atmosphere, that nothing can be seen.

At the rigorously computed time the "Kavkazy" descend into a sweet green cornfield of the sovkhoz "Tersakanskiy" in Turgayskaya Oblast. The helicopters of the search and rescue service landed side-by-side almost simultaneously.

Petr Klimuk and Miroslaw Hermaszewski emerge from the ship joyful and smiling. The space journey has been successfully completed with the participation of an international crew. The heroes are heartily congratulated by specialists of the search team, Aleksey Leonov, and Polish journalists who came here especially for the event.

The physicians measure the pulse and blood pressure of the cosmonauts. Everything is in order! They feel very well!

The helicopters rise into the sky and head for Arkalyk. There thousands of persons have gathered at the airport. Welcoming banners and bouquets of flowers... The cosmonauts are met with vigorous applause and exclamations of "Hurrah!" "Bravo!" At a brief meeting they are given mementos. Petr and Miroslaw express sincere appreciation for the congratulations and warm greetings.

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COMMENTS ON MEDICAL DEVICES SUPPLIED BY POLISH SCIENTISTS

Moscow KRASNAYA ZVEZDA in Russian 4 Jul 78 p 4

[Article by V. Ovcharov: "The Space Watch Continues"]

[Excerpt] In speaking of original medical and psychological experiments, Academician J. Rychlewski had in mind such Soviet-Polish experiments as the "Kardiolider," "Dosug" and "Opros." What is the essence of the mentioned experiments?

The "Kardiolider" experiment consists of two parts. In the first case the "Kavkazy" successively donned the "Chibis" suit, by means of which a rarefaction is created for the lower half of the body. As is well known, such a simulation results in the outflow of blood from the head to the legs. In the second case, use is made of the on-board bicycle-type ergometer. In both cases the specialists check the state of the cardiovascular system. This was done using the "Kardiolider-DOI" instrument. The latter was fabricated by the x-ray apparatus and medical devices plant in Warsaw.

The action of the instrument is based on an analysis of the dynamics of cardiac contractions by means of measuring the bioelectric currents of the heart. The instrument weighs only 200 grams, has an autonomous current source and makes it possible to check the changes in the frequency of cardiac contractions in a wide range -- from 60 to 180 beats per minute. Using a bicycle-type ergometer the "Kavkazy" have carried out two loads of a conditioning nature: limbering up (to a pulse rate of 130 beats per minute) and increasing (up to 150). When the frequency of cardiac contractions exceeded these stipulated levels, the instrument triggered a signal and the cosmonauts in the first case reduced the intensity of turning of the pedals, and in the second case stopped it altogether.

Scientists feel that the results of such investigations will make it possible to develop an effective system for preventing disorders of the cardiovascular system during prolonged space flights and maintenance of high performance of cosmonauts during all flight stages.

A constantly good mood is a wonderful blessing. It is particularly important to maintain and support it if the flight is prolonged. How is this to be achieved? One of the answers to this question is being sought by specialists of institutes in our country, the Institute of Aviation Medicine and Polish Television, which have proposed that the "Dosug" experiment be carried out in space. This experiment is outwardly simple; the cosmonauts must view a scientifically devised distracting television program. Then they write their evaluations in the ship's log. It is interesting that these transmissions were carried out in such a way that in principle not only Miroslaw Hermaszewski (whose tastes were regarded as a "reference point") would be pleased, but also all the remaining crew members.

With respect to the "Opros" experiment, it is being carried out for evaluating the influence of different spaceflight factors on the feeling of well-being and performance of crew members also during a prolonged expedition. Jointly with Soviet scientists, the specialists of the Institute of Aviation Medicine of the Polish People's Republic have developed a special diary-log for the cosmonauts.

All these experiments have great importance even today when expeditions aboard orbital stations are becoming increasingly saturated and prolonged. But they are still more important for the tomorrow of cosmonautics. Indeed, the time is probably coming when the work of the crews aboard stations will continue for long months, and possibly years. The time is coming when earthlings will travel on interplanetary ships into the distant expanses of space in order, upon their return, to bring to man the knowledge which they have won from the universe.

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DETAILS OF "VKUS" (TASTE) EXPERIMENT GIVEN

Moscow KRASNAYA ZVEZDA in Russian 1 July 78 p 3

[Article by V. Ovcharov: "The Working Rhythm in Orbit"]

[Excerpt] Yes, weightlessness is of assistance to technologists. But for physicians it causes completely opposite emotions. Much is already known about the influence of weightlessness on the human body. And nevertheless, much about it still remains a mystery. For example, the relationship between weightlessness and taste sensations. Many cosmonauts have told about the change in taste sensations. This fact has also been noted by scientists of the Military Institute of Aviation Medicine of the Polish People's Republic, studying the condition of people in temperature and pressure chambers, and also under overload (acceleration) conditions. Polish scientists also proposed that the "Vkus" experiment be carried out on the orbital complex. This is described by Doctor of Medical Sciences A. Yegorov:

"Changes in taste sensations, as reported by cosmonauts, have never before been studied quantitatively. And this is very important. And not only from the point of view of theory, but also from the practical point of view. By knowing the mechanism of this phenomenon, we can maintain the usual taste sensations in the cosmonauts. In the experiment we make use of a method based on the aspecific study of the taste sensations, that is, we do not use food products themselves, but an electric current. We are interested in the minimum current which will cause taste sensations.

Prior to the flight of Petr Klimuk and Miroslaw Hermaszewski this experiment was carried out on the earth. The problem now is to ascertain on the first days of flight in space of the taste threshold experienced under weightlessness conditions. For this purpose Polish scientists have developed a special instrument, an electrogustometer (electric taste meter), causing electric excitation of the taste nerves. The electric d-c impulse, when using two electrodes, one of which is applied to a certain part of the tongue, with the other being in the cosmonaut's hand, causes the appearance of a metallic or acid taste. This occurs as a result of excitation of the taste buds and the appearance of H and OH ions as a result of electrolysis of fluid in the

mouth. The instrument is very convenient. It consists of a generator of saw-tooth voltage, making it possible to obtain a variable current strength between the electrodes in the range from 0 to 300 microamps, and a digital measuring system. This system also registers the current strength at which a taste sensation appears.

[496]

UNDOCKING OF "SOYUZ-30" DESCRIBED

Moscow TRUD in Russian 6 Jul 78 p 3

[Article by V. Golovachev: "Goodbye, 'Salyut'"]

[Text] Yesterday the second international space crew completed work aboard the orbital complex "Salyut-6"--"Soyuz-29"--"Soyuz-30." Vladimir Kovalenok and Aleksandr Ivanchenkov are continuing their cosmic watch, whereas Petr Klimuk and Miroslaw Hermaszewski have returned to earth.

The preparations for this began on Tuesday. For more than four hours Klimuk and Hermaszewski transported the equipment which was to be returned and packed it in the cabin of the "Soyuz-30": motion picture and photographic films, the results of experiments to be carried out, ampules with alloys obtained in the electric furnace aboard the station, containers with biological objects, necessary documentation and many other things. Specialists on earth are with impatience awaiting the materials from space research, and in particular, the motion picture and still photographs. These data are used by 400 organizations in our country. It has been calculated that the cost of space surveying and interpretation of materials for only one mountainous region with an area of about a million square kilometers was approximately six million rubles. But the economic effect from the newly detected underground reserves of raw materials exceeds this sum by many times. Even today cosmonautics is giving an increasingly more weighty contribution to the national economy.

The cosmonauts checked on the operability of "Soyuz-30" systems. This operation is essential: after docking of the ship to the station virtually all the instrumentation aboard it is shut down. At this time particular attention is devoted to the safeguarding of the transport ship against overcooling. It is a fact that heat from the station, even when the hatches are open, does not readily pass into the "Soyuz" compartments: heat exchange under weightlessness conditions transpires quite differently than on the earth. Accordingly, fans are used for driving warm air from the station into the ship through a special conduit. In order that the fuel for the control engines will not freeze the ship has an operating heat-regulating system. The cosmonauts of the first expedition discovered before undocking that moisture had appeared on the ship's windows. This means that the walls were rather

cold. That is not good: who knows in what instruments and units in the ship moisture may appear? On this flight measures were taken so that warm air would intensively enter into the "Soyuz-30." The cosmonauts reported that all the systems of the transport ship are operating faultlessly.

...The last warm words of farewell, friendly jests, and at 1007 hours the transfer hatch connecting the "Soyuz-30" transport ship with the "Salyut-6"- "Soyuz-29" orbital complex began to close.

During two revolutions around the earth the cosmonauts made ready for a most serious operation -- undocking. At 13 hours 14 minutes 50 seconds the "Soyuz-30" began a slow departure from the orbital station. For some time they flew side-by-side and then the distance between them began to increase rapidly.

Flying once more around the earth, the "Kavkazy" reported to the Control Center that they were ready for the landing. Clad in spacesuits, they laid back in the shock-absorbing seats of the descent module, held tight by their harness.

The director of training of Soviet cosmonauts, Lieutenant General of Aviation V. A. Shatalov, who has been in space three times, reported to the crew that the weather in the landing region was good and that all the search services were in complete readiness, and also gave some practical advice to the cosmonauts.

At 1544 hours the "Soyuz-30" braking engine was fired. It operated for 208.1 seconds, putting the ship into a descent trajectory.

The ship's orbit was high and 20 minutes more remained before entry into the dense layers of the atmosphere. Not long before entry into the atmosphere, and specifically at 16 hours 02 minutes 24 seconds, there was separation of the "Soyuz-30" into three parts: descent module, orbital and instrument-assembly compartments. The latter two were to burn up in the atmosphere and the cabin and the cosmonauts began a descent which was controllable in the atmosphere. The control was accomplished by the on-board automation system with the assistance of six microjet engines in such a way that the accelerations were small.

Ten minutes passed and the braking parachute of the main system opened at an altitude of 9,500 km (in the descent module there is also a reserve parachute system). The descent velocity decreases.

It is reported from the aircraft and helicopters of the search services that the descent module has been observed and that radio contact has been established with the crew.

A large-scale map of the landing region can be seen on one of the screens at the Control Center. The actual trajectory of descent coincides with the computed trajectory and a brightly lit point shows where the space vehicle should land. The computations of the specialists were precise.

When one meter remained to the earth the soft landing engines were fired, raising a cloud of dust, and the vehicle landed with a low velocity -- only 3-4 meters per second. The shock-absorbing seats softened the impact. The flight had ended. Today the cosmonauts should arrive in Star City.

Now a citizen of the German Democratic Republic is being readied for the next orbital flight together with a Soviet cosmonaut. This flight is also being planned for this year. The training of cosmonauts from Bulgaria, Hungary, Cuba, Mongolia and Romania is now proceeding successfully at Star City. The storming of space is becoming more and more intensive.

[493]

UNLOADING OF "PROGRESS-2" DESCRIBED

Moscow IZVESTIYA in Russian 11 Jul 78 p 3

[Article by B. Konovalov: "Day-to-Day Work in the Space Port"]

[Summary] On Sunday 9 July V. Kovalenok and A. Ivanchenkov awaited the arrival of the "Progress-2" freighter, which had been launched at the Baykonur cosmodrome on 7 July. For two days the freighter slowly approached the orbital station... At 1559 hours Moscow time, somewhere in the sky above the Caspian Sea, the freighter approached the space port and began the docking process. Beginning on Monday the cosmonauts began to unload the "Progress." This ship had brought approximately 300 items, the total weight being about two tons. Most of this was accounted for by fuel for the engines, but there were also oxygen regenerators, water, food and other expendable items. Each freighter, replenishing these supplies, lengthens the lifetime of the station. In addition, a significant part of the freight consists of motion picture and ordinary photographic film, new scientific equipment, extra instruments and tools. The "Progress-2" brought a new furnace for continuing the technological experiments, which are assuming an increasing scale due to their exceptional importance for the national economy. Professor Feoktistov states that in the future some of the rooms in orbital stations will be occupied by workshops for the production of valuable materials under weightlessness conditions. But space will also be used for the production of electric power. It will be possible to intercept solar energy by semiconductor cells and transmit it to the earth through a radio channel in the microwave range. The cost of a kilowatt of space power will be comparable to the cost of power from terrestrial stations, but without environmental contamination. Solar power stations, if they are to be profitable, must have a great power of 5-10 billion KW. Space power plants would be too large to launch into space as ready-to-operate units; different parts would have to be launched separately and then assembled in orbit.

[497A]

ADDITIONAL NOTES ON UNLOADING OF "PROGRESS-2"

Moscow PRAVDA in Russian 12 July 78 p 6

[Article by Yu. Apenchenko: "It's Becoming Ordinary"]

[Summary] The crew has now begun unloading of the transport ship. This very tedious work began on Monday and it will last a long time. When in the course of the last expedition to "Salyut-6" the first freighter tied up the duration of the operations caused some concern. It is no easy matter to move 1 1/2 tons of freight. Even in a state of weightlessness. The list of transported items is astonishing: a mere listing takes up 15 pages of closely spaced typing. And there is a real problem in the placement of the items which arrived in the freighter. Weightlessness is a hindrance, as well as a help: weight helps in controlling movements. Under weightlessness conditions the accuracy of movements is a real problem. Each object taken from the "Progress" must be put once and for all in a specific place in the station. But that place in most cases is already occupied by something else! That means more moving. And all this must be controlled carefully so that everything can be found when necessary. The freighter delivered fuel for the engines, water and food. For example, there was technical equipment such as the new "Kristall" furnace. The cosmonauts had to set it up themselves. On the proposal of Yuriy Romanenko and Georgiy Grechko the necessary tools had been delivered. There were also many personal items, such as linen, clothing and lamps... The ordinary workday is like this: after breakfast, about two hours of unloading work. The noon meal and then an hour of rest. This hour Kovalenok and Ivanchenkov usually pass near the windows. Then two more hours of work with the "Progress." Then two hours of physical exercise. At the end of the day, summarization of the results and a review of the program for the next day...

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Abstracts of Scientific Articles

ENERGY SPECTRUM OF RADIO WAVES EMITTED BY "VENERA-10"

Moscow KOSMICESKIYE ISSLEDOVANIYA in Russian Vol 16, No 3, 1978 pp 419-428

[Article by A. I. Yefimov, O. I. Yakovlev, V. M. Razmanov, V. I. Rogal'skiy and V. K. Shtrykov, "Energy Spectrum of Radio Waves Emitted by the 'Venera-10' During Radio Probing of the Circumsolar Medium and Determination of the Characteristics of Plasma Turbulence"]

[Abstract] The article presents data on change of the energy spectrum of radio waves from the vehicle "Venera-10" in experiments with radioprobing of circumsolar plasma. The authors have determined the widths of the spectra of radio waves and the dependence of the spectral density of energy on frequency, as well as the variation of these parameters with angular distance between the sun and the vehicle. It is shown that for angular distances greater than 2° the wings of the spectra are approximated by a power law with an exponent equal to 2.7. With angular distances less than 1.5° the form of the spectra becomes close to Gaussian. A change in width of the spectral line with radial distance also occurs in conformity to a power law whose exponent is equal to 3.6. The article discusses the structure of turbulence in circumsolar plasma. The spatial three-dimensional spectrum of fluctuations of electron concentration was close to the theoretical Kolmogorov spectrum and the standard deviations of the electron concentration inhomogeneities are commensurable with the mean density of the particles, which is evidence of a strong plasma turbulence.

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ACCURACY CRITERION FOR DETERMINING ORIENTATION OF ARTIFICIAL SATELLITE

Moscow KOSMICESKIYE ISSLEDUVANIYA in Russian Vol 16, No 3, 1978 pp 339-344

[Article by A. M. Titov and V. P. Shchukin, "Some Properties of the Accuracy Criterion in Determining Orientation of an Artificial Earth Satellite"]

[Abstract] A study was made of some properties of the accuracy criterion in determining the angular position of an artificial earth satellite as the distances between the orthogonal matrices. The authors derive approximate expressions for the criterion in the case of small errors in determining angles. In a stochastic case, on the basis of the Rao-Cramer inequality, it was possible to find the lower limit for the distance between the orthogonal matrices. It has been established that for a multivector system of measurements the lower limit of the invariant relative to the parameters to be evaluated also is dependent on the statistical properties of the measurement errors and the mutual positioning of the vectors to be measured.

[469]

ANALYTICAL SOLUTION OF EQUATIONS OF MOTION FOR ATMOSPHERIC RE-ENTRY

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 3, 1978 pp 361-369

[Article by V. N. Baranov, "Approximate Analytical Solution of Equations of Motion for Atmospheric Re-entry"]

[Abstract] The author proposes solutions of the equations of motion for the center of mass of a descent module giving the analytic dependence of trajectory parameters as a function of one of the phase coordinates. It was possible to find an explicit temporal dependence of the phase coordinate used in the integration of the equations of motion for the independent variable. This makes it possible to refine the solution on the basis of an approximate allowance for gravitational rotation. The author has derived simple finite expressions for trajectory parameters which are convenient for computations. For the purpose of clarifying the accuracy of the analytical solutions they are compared with the results of electronic computer numerical integration of the initial equations of motion. In contrast to earlier investigations of the problem, the solution was obtained without use of additional restrictions on the form of the trajectory. The problem is solved in stages. This makes it possible, depending on the required accuracy, to select the corresponding forms of the solution. A method is proposed for computing the trajectory for the case of a nonisothermal atmosphere. The solutions found can be employed in a preliminary selection of the planned parameters of the descent module, in programming the descent trajectories, and also in approximate determination of the region of optimum solutions in an investigation of different problems in dynamics and control during descent in the atmosphere, associated with solution of boundary value problems.

[469]

SPACE PHOTOGRAPHIC SURVEYS FOR WORK IN HYDROGEOLOGY

Leningrad IZVESTIYA VSESOYUZNOGO GEOGRAFICHESKOGO OБSHCHESTVA in Russian
Vol 110, No 3, 1978 pp 214-218

[Article by A. L. Revzon, "Morphosystemic Approach to an Analysis of Materials from a Space Photographic Survey for Solution of Problems in Hydrogeology and Geological Engineering in Arid Regions"]

[Abstract] The interpretation of space photographs for solving problems in hydrogeology and geological engineering in arid regions, due to the high degree of generalization of the photographs, differs methodologically from the interpretation of aerial photographs. The small scale of space images does not make it possible to use elementary landscapes as indicators of hydrogeological and geological engineering conditions. The soil-vegetation cover on such photographs cannot be seen and as a result there is a clear expression of the geostructural complexes which are manifested in the relief and which are emphasized by exogenous processes -- morphosystems and their elements. Their use as indicators will make it possible to solve problems related to study of the dynamics of ground water, hydrogeological and geological engineering mapping and regionalization.

[470]

MOTION OF BODIES IN JOVIAN ATMOSPHERE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 3, 1978 pp 378-387

[Article by E. A. Gershbeyn, E. Ya. Sukhodol'skaya, S. L. Sukhodol'skiy and G. A. Tirskiy, "Motions of Bodies in the Jovian Atmosphere with Allowance for Change in Their Mass and Configuration Under the Influence of Aerodynamic Heating"]

[Abstract] A study was made of radiation heating and thermochemical destruction of the surfaces of probes entering the Jovian atmosphere with velocities of 40-60 km/sec. The equations of radiation gas dynamics are solved jointly with the equations for motion of the probe in the atmosphere. The change in the ballistic factor associated with a change in the mass and configuration of the vehicle due to evaporation of its surface is taken into account. In computations of the thermal radiation fluxes an allowance is made for radiation transfer in the continuous spectrum and in the lines. Data are given on the disturbance of the entry trajectory and the total loss of mass associated with allowance for change in the ballistic factor due to change in the configuration and mass of the body in the aerodynamic braking process. The authors give the distribution of the radiant fluxes to the body along the trajectory and the real value of the coefficient of attenuation of radiation by a vapor layer.

[469]

SPECTRAL COMPOSITION OF SOLAR RADIATION IN VENUSIAN ATMOSPHERE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 3, 1978 pp 412-418

[Article by B. Ye. Moshkin, A. P. Ekonomov and Yu. M. Golovin, "Spectral Composition of Solar Radiation in the Venusian Atmosphere According to the Results of Measurements of Illumination on the Descent Modules of the 'Venera-9' and the 'Venera-10'"]

[Abstract] On the basis of the results of measurements of radiant fluxes carried out on the descent modules of the "Venera-9" and "Venera-10," the authors have determined the spectral composition of radiation at different altitudes, have obtained the vertical profiles of photometric and energy illumination in the range $0.5-1\mu\text{m}$ and have evaluated the quantity of solar radiations absorbed by the atmosphere and the surface. Specifically, it was found that during the daytime in the equatorial region the atmosphere absorbs about 18% and the surface absorbs about 3% of the solar energy. There was found to be a photometric illumination $E \approx 12$ and 8 kilolux, an energy illumination $P \approx 95$ and 60 W/m^2 and a surface albedo $A \approx 0.05$ and 0.1 in the range $0.5-1.0\mu\text{m}$ at the landing sites of the two vehicles.

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MEASUREMENT OF ELECTRON-ION CONCENTRATION USING "VERTIKAL'-4" ROCKET

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 3, 1978 pp 394-397

[Article by G. L. Gdalevich, S. K. Chapkanov, L. G. Bankov, V. F. Gubskiy, Ts. P. Dachev and Kh. M. Petrunova, "Results of Measurement of Concentration of Electrons and Ions and Electron Temperature Using the 'Vertikal'-4' Rocket"]

[Abstract] The "Vertikal'-4" rocket, which was launched to an altitude of $\sim 1,500$ km, took place on 14 October 1976 in the middle latitudes in the European USSR. Among other scientific instruments it carried a cylindrical Langmuir probe for measuring the concentration and temperature of ions and a spherical ion trap for measuring the concentration of positive ions. The article presents and discusses the vertical distributions of the concentration of ions and the temperature of electrons. The profiles of electron temperature and the concentrations of electrons and ions at altitudes 100-1,500 km presented in this paper were obtained with an almost vertical rocket launching over a period of about 10 minutes. The n_e and n_i values in the region of the F-layer maximum are in good correspondence with the results given by D. F. Strobel, et al., PLANET SPACE SCI., 18, 1181, 1970 and L. H. Brace, et al., JGR, 74, 2952, 1969. They represent normal conditions in the ionosphere at the time of low solar activity and in the middle latitudes. The altitude of the F-layer maximum is 220

km. This is approximately 10 km lower than in the theoretical model given by D. F. Strobel. Spherical probes have some mass-spectrometer possibilities. As a result of the great difference in the atomic weight of the oxygen and hydrogen ions with a great flow velocity, using spherical probes it is possible to ascertain their concentrations. The trajectory peculiarities of the "Vertikal'-4" rocket make it possible to determine the concentration of these ions at altitudes less than about 1,200 km.
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SPECIAL CASE OF DYNAMICS OF PRECESSIONAL ROTATION OF SPACECRAFT

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 3, 1978 pp 353-360

[Article by V. A. Tkachenko, "Analysis of Dynamics of Precessional Rotation of a Spacecraft with a Power Flywheel in a Cardan Joint with Viscoelastic Shock Absorbers in the Case of Uniaxial Correction"]

[Abstract] A study was made of the dynamics of a nonlinear system of equations used in the uniaxial correction of motion at the time of precessional rotation of a spacecraft with a power flywheel in a Cardan joint with viscoelastic shock absorbers using signals from sensors with relay characteristics. The author demonstrates the possibility of separating the first approximation equations into two independent subsystems determining the transient regime and steady oscillatory motion respectively. Recommendations are given on choice of the parameters of the relay characteristics of the sensors.
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DISPERSION OF ELECTRON BEAM DISTRIBUTION FUNCTION IN IONOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 18, No 3, 1978 pp 525-526

[Article by N. I. Izhovkina, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, "Dispersion of the Electron Beam Distribution Function in the Ionosphere as a Function of Distance to the Injection Point"]

[Abstract] In connection with the tasks of the Soviet-French "Araks" experiment, it was necessary to compute the distribution functions for electron beams for stipulated initial parameters of an electron burst injected from aboard a rocket. Some results of computations of the distribution function for an electron beam in the ionosphere for different distances from the place of beam injection along the line of force of the geomagnetic field are shown in Figures 1 and 2 in the article; these data are

analyzed in detail. It is shown that the beam structure of the electron flux can persist at a distance of several tens of kilometers from the injection point. The computations show that the mean statistical radius for the considered beam is $r = 12.41$ and 68 m respectively at altitudes $h = 130$, 110 and 100 km, that is, the beam widens slowly due to collisions with neutral particles to several Larmor radii. It is concluded that direct measurements of the beam distribution functions and the effects accompanying the propagation of electron beams in the ionosphere and subsequent comparison with computed data would make it possible to obtain interesting results on interaction of an electron beam with plasma.

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INHOMOGENEITIES IN THE E_s LAYER OF THE AURORAL IONOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 18 No 3, 1978 pp 436-439

[Article by N. N. Volkov and R. S. Kukushkina, Polar Geophysical Institute, Kola Affiliate USSR Academy of Sciences, "Large-Scale Inhomogeneities in the E_s Layer of the Auroral Ionosphere"]

[Abstract] The authors have determined the spectra of large-scale inhomogeneities in the E_s layer of the auroral ionosphere in the interval 10-100 km on the basis of measurements of the azimuthal and zenith angles of incidence of reflected radio waves and the drift velocity of small-scale inhomogeneities. The measurements were made in January 1977 at Loparskaya. Reflections from the E region in January were for the most part E_s type r. Twenty-five observation periods with a duration from 25 to 50 minutes were selected. The mean intensity of the inhomogeneity was computed for each observation period at a series of frequencies. The spectra of inhomogeneities were analyzed from records with a duration of not less than 30 min. It is shown that with a change in magnetic conditions from quiet to disturbed it is possible to observe a weak tendency to a growth in the spectral exponent and the intensity of inhomogeneities. The paper gives the distributions of the probability of appearance of large-scale inhomogeneities in the E_s layer with periods from 2 to 12 minutes at frequencies 2.51, 3.18, 3.84 and 4.51 MHz. At all frequencies the most probable periods were 4-5 minutes. The spectra of large-scale inhomogeneities in the E_s layer agree with the form of the spectra of small-scale inhomogeneities in the auroral E region cited by T. Ogawa, et al. (J. RADIO RES. LAB., 22, 1, 1975.

[463]

STUDY OF GROUND WATER FROM SPACE

Moscow ZEMLYA I VSELENNAYA in Russian No 2, 1978 pp 59-64

[Article by R. G. Dzhamalov, I. S. Zektser and V. A. Ivanov, "Study of Ground Water from Space"]

[Abstract] The use of artificial satellites in hydrogeology is discussed. The use of space methods makes it possible to study local and regional hydrogeological peculiarities of the earth's surface simultaneously. It is possible to detect regions with ground water and the depth at which it lies. It is possible to ascertain the source of this ground water and how it is related to surface waters. Photographic and television surveys and their interpretation are discussed. IR surveys are made primarily in regional studies. Satellites carry radiometric devices which make it possible to obtain images of the thermal emission of the earth's surface. Such surveys give data on relative soil moisture content, often an indicator of various hydrogeological processes. This method is particularly effective in detecting the entry of ground water into rivers, seas and lakes. On the other hand, a microwave survey has the advantage that it can be used in cloudy weather. Radiation in the microwave range has a great penetrating power and an exceptional sensitivity to the composition of the investigated object and its temperature. Experimental data indicate that microwave radiation can penetrate to several tens of centimeters, but theoretical studies suggest that ground water can be detected at depths up to 10 m. Another variant is a radar survey. It can be made under any weather conditions and gives information on the deeper layers. At present little use is made of this method in hydrogeology, but it appears that it can be used very successfully in the search for ground water.

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